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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/997,751	11/28/2001	Nicholas F. Borrelli	SP01-323	3699

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CORNING INCORPORATED
SP-TI-3-1
CORNING, NY 14831

EXAMINER
ANGEBRANNDT, MARTIN J

ART UNIT	PAPER NUMBER
1756	4

DATE MAILED: 09/04/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

AS-4

Office Action Summary	Application No.	Applicant(s)	
	09/997,751	BORRELLI ET AL.	
	Examiner	Art Unit	
	Martin J Angebranndt	1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *4/15/2002 & 5/27/2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-48* is/are pending in the application.

4a) Of the above claim(s) *18,19,30,31,39 and 40* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17,20-29,32-38 and 41-48* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☒ Claim(s) *1-48* are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *2&3* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1-17,20-38 and 41-48, drawn to making a waveguide using two passes of a femtosecond laser, classified in class 430, subclass 321.

II. Claim18,19,30,31,39 and 40, drawn to a waveguide with an enlarged dimension, classified in class 385, subclass 132.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions group I and group II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the method may be used to form grooves or channels by removing material and/or the waveguide may be made using a single laser pass or a selective deposition during formation of the substrate.

3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification and their recognized divergent subject matter, restriction for examination purposes as indicated is proper.During a telephone conversation with Timothy M. Schaeberle (34,424) on August 25, 2003 a provisional election was made without traverse to prosecute the invention of group I, claims 1-17,20-38 and 41-48. Affirmation of this election must be made by applicant in replying to this Office action. Claim18,19,39 and 40 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

4. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 1-4,8-13,16,17,20-29,32 and 41-44 are rejected under 35 U.S.C. 102(b) as being fully anticipated by Kondo et al., "Three-Dimensional Microdrilling of Glass by Multiphoton Process and Chemical Etching", Jpn. J. Appl. Phys., Vol 38(2) pt 10A (1999) (pp L1146-L1148).

Kondo et al., "Three-Dimensional Microdrilling of Glass by Multiphoton Process and Chemical Etching", Jpn. J. Appl. Phys., Vol 38(2) pt 10A (1999) (pp L1146-L1148) describes

the use of multiphoton processes to form a "Y" coupler in a glass substrate shown in figure 3. The laser pulses are 125 +/- 5 fs. (page L1147).

The examiner notes that the paths diverge, but are embraced by the "substantially parallel" language as the specification does not provide any guidance as to what degree of divergence this embraces. The examiner holds that a widened area occurs where the "Y" branching occurs. The examiner notes that the reference specifically points to multiphoton processes and non-resonant wavelengths.

8. Claims 1-3,8,9,13,16,17,20,21,32 and 41-44 are rejected under 35 U.S.C. 102(b) as being fully anticipated by Hirao et al., "Writing Waveguides and Gratings in Silica and Related Materials by a Femtosecond Laser", J. Non-Crystal. Sol., Vol. 239 pp 91-95 (1998)

Hirao et al., "Writing Waveguides and Gratings in Silica and Related Materials by a Femtosecond Laser", J. Non-Crystal. Sol., Vol. 239 pp 91-95 (1998) describes the use of multiphoton processes to form a crossed waveguide in a glass substrate shown in figure 1. The laser pulses are 120 fs. (page 92).

The crossing of the two waveguides is held to make one wider in a transverse dimension in a portion.

9. Claims 1-4,8-13,16,17,20-29,32 and 41-44 are rejected under 35 U.S.C. 102(b) as being fully anticipated by Homoelle et al., "Infrared Photosensitiveity in Silica Glasses Exposed to Femptosecond Laser Pulses", Opt. Lett., Vol. 24(18) pp. 1311-1313.

Homoelle et al., "Infrared Photosensitiveity in Silica Glasses Exposed to Femptosecond Laser Pulses", Opt. Lett., Vol. 24(18) pp. 1311-1313 describes the use of multiphoton processes

to form a "Y" coupler in a glass substrate shown in figure 3. The laser pulses are 60 fs. (page 1311, figure 1).

The examiner notes that the paths diverge, but are embraced by the "substantially parallel" language as the specification does not provide any guidance as to what degree of divergence this embraces. The examiner holds that a widened area occurs where the "Y" branching occurs. The examiner notes that the reference specifically points to multiphoton processes and non-resonant wavelengths.

10. Claims 1-3,8,9,13,16,17,20,21,32 and 41-44 are rejected under 35 U.S.C. 102(b) as being fully anticipated by Davis et al. "Writing Waveguides in Glass with a Femtosecond Laser", Opt. Lett., Vol. 21(21) pp 1729-171731 (1996).

Davis et al. "Writing Waveguides in Glass with a Femtosecond Laser", Opt. Lett., Vol. 21(21) pp 1729-171731 (1996) describes the use of multiphoton processes to form a crossed waveguide in a glass substrate shown in figure 1. The laser pulses are 120 fs. (page 92).

11. Claims 1-3,8,9,13,16,17,20,21,32 and 41-44 are rejected under 35 U.S.C. 102(b) as being fully anticipated by Presentation by Hirao, K. at the First International Symposium on Laser Precision Microfabrication, (Omiya, Saitama, Japan 06/2000) as reported in Hirao, K, "Internal Modification of Glass Materials with a Femptosecond Laser", Proc. SPIE, Vol. 4088 pp 33-39 (2000).

Hirao, K., "Internal Modification of Glass Materials with a Femptosecond Laser", Proc. SPIE, Vol. 4088 pp 33-39 (2000) describes the use of multiphoton processes to form a crossed waveguide in a glass substrate shown in figure 1.

12. Claims 1-4,8-13,16,17,20-29,32 and 41-44 are rejected under 35 U.S.C. 102(a) as being fully anticipated by Borrelli et al., WO 01/09899.

Borrelli et al., WO 01/09899 describes the use of multiphoton processes to form a "Y" coupler in a glass substrate shown in figure 10 (see example 10 and example 1). The laser pulses are 60 fs. (example 1). The use of translation in one or more directions is disclosed. (5/28-30). The use of the disclosed techniques to form various optical articles including couplers is disclosed. (18/29-35 and 19/11-18). A central waveguide with surrounding waveguides is disclosed with respect to figure 9a. The hourglass foci shapes are disclosed with respect to figures 3a and 3c

The examiner notes that the paths diverge, but are embraced by the "substantially parallel" language as the specification does not provide any guidance as to what degree of divergence this embraces. The examiner holds that a widened area occurs where the "Y" branching occurs. The examiner notes that the reference specifically points to multiphoton processes and non-resonant wavelengths.

13. Claims 1-13,16,17,20-29,32,36-38,41-44 and 46-48 are rejected under 35 U.S.C. 103(a) as being unpatentable over **either** Borrelli et al., WO 01/09899, Aitkin et al. '026, Homoelle et al., "Infrared Photosensitiveity in Silica Glasses Exposed to Femptosecond Laser Pulses", Opt. Lett., Vol. 24(18) pp. 1311-1313 **or** Kondo et al., "Three-Dimensional Microdrilling of Glass by Multiphoton Process and Chemical Etching", Jpn. J. Appl. Phys., Vol 38(2) pt 10A (1999) (pp L1146-L1148), in view of Itoh et al., "Fabrication of SmallBragg Reflectors in Glass with Refractive Index Change Induced by Ultrashort Laser Pulses", Proc. SPIE vol. 3801 (07/1999) pp. 158-168 and Copley et al. '957.

Aitkin et al. '026 describes the use of multiphoton processes to form couplers in a glass substrate is disclosed with respect to figures 11a-d (10/44-11/4). The laser pulses are 30 fs. (example 1). The use of translation in one or more directions is disclosed. (5/43-54). A central waveguide with surrounding waveguides is disclosed with respect to figure 11a. The hourglass foci shapes are disclosed with respect to figures 3a and 3c. The use of these techniques for form gratings and waveguides is disclosed. (1/27-40 and 10/44-11/4)

Itoh et al., "Fabrication of Small Bragg Reflectors in Glass with Refractive Index Change Induced by Ultrashort Laser Pulses", Proc. SPIE vol. 3801 (07/1999) pp. 158-168 teach the formation of parallel rectangular stripes where the dimensions differ significantly. This is achieved by scanning the focus of the laser while moving the sample in the X and Y directions.

Copley et al. '957 teach the use of overlapping scans of a laser to form parallel grooves to remove a layer. The variation of the focus of the laser is also disclosed to allow shaping of the resultant surface. (1/31-56 and 3/11-26).

It would have been obvious to one of ordinary skill in the art to modify the teachings and examples of **either** Borrelli et al., WO 01/09899, Aitkin et al. '026, Homoelle et al., "Infrared Photosensitiveity in Silica Glasses Exposed to Femptosecond Laser Pulses", Opt. Lett., Vol. 24(18) pp. 1311-1313 **or** Kondo et al., "Three-Dimensional Microdrilling of Glass by Multiphoton Process and Chemical Etching", Jpn. J. Appl. Phys., Vol 38(2) pt 10A (1999) (pp L1146-L1148) to form rectangular patterns which have rectangular dimensions, similar to those disclosed by Itoh et al., "Fabrication of Small Bragg Reflectors in Glass with Refractive Index Change Induced by Ultrashort Laser Pulses", Proc. SPIE vol. 3801 (07/1999) pp. 158-168 but are wider using the overlapping laser technique disclosed by Copley et al. '957 with a reasonable

expectation of achieving comparable results based upon the disclosure of similar forms being produced.

14. Claims 1-17,20-29,32-38 and 41-48 are rejected under 35 U.S.C. 103(a) as being unpatentable over **either** Borrelli et al., WO 01/09899, Aitkin et al. '026, Homoelle et al., "Infrared Photosensitiveity in Silica Glasses Exposed to Femptosecond Laser Pulses", Opt. Lett., Vol. 24(18) pp. 1311-1313 **or** Kondo et al., "Three-Dimensional Microdrilling of Glass by Multiphoton Process and Chemical Etching", Jpn. J. Appl. Phys., Vol 38(2) pt 10A (1999) (pp L1146-L1148), in view of Miura et al.,"Preparation and Optical Properties of Fluoride Galss Waveguides Induced by Laser Pulses", J. Non-Crystal. Sol., Vol. 256-257 (1999) pp. 212-219, Itoh et al., "Fabrication of SmallBragg Reflectors in Glass with Refractive Index Change Induced by Ultrashort Laser Pulses", Proc. SPIE vol. 3801 (07/1999) pp. 158-168.

Miura et al.,"Preparation and Optical Properties of Fluoride Galss Waveguides Induced by Laser Pulses", J. Non-Crystal. Sol., Vol. 256-257 (1999) pp. 212-219 teaches that the use a serial laser pulses over the same area does not significantly increased the size of the features with respect to figure 9 (217).

Dunsky et al. '363 teach using a spiral path to form a circular pattern by nibbling the edge to achieve the final desired shape (14/51-65).

15. It would have been obvious to one of ordinary skill in the art to modify the teachings and examples of **either** Borrelli et al., WO 01/09899, Aitkin et al. '026, Homoelle et al., "Infrared Photosensitiveity in Silica Glasses Exposed to Femptosecond Laser Pulses", Opt. Lett., Vol. 24(18) pp. 1311-1313 **or** Kondo et al., "Three-Dimensional Microdrilling of Glass by Multiphoton Process and Chemical Etching", Jpn. J. Appl. Phys., Vol 38(2) pt 10A (1999) (pp

L1146-L1148) to form circular waveguide core patterns similar to those disclosed by Miura et al.,"Preparation and Optical Properties of Fluoride Glass Waveguides Induced by Laser Pulses", J. Non-Crystal. Sol., Vol. 256-257 (1999) pp. 212-219Itoh et al., "Fabrication of Small Bragg Reflectors in Glass with Refractive Index Change Induced by Ultrashort Laser Pulses", Proc. SPIE vol. 3801 (07/1999) pp. 158-168 but are larger using the overlapping laser technique disclosed by Dunsky et al. '363 with a reasonable expectation of achieving comparable results based upon the disclosure of similar forms being produced using a combination of translation of the substrate and shifting of focus by Itoh et al., "Fabrication of SmallBragg Reflectors in Glass with Refractive Index Change Induced by Ultrashort Laser Pulses", Proc. SPIE vol. 3801 (07/1999) pp. 158-168.

16. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Dugan et al. 2003/0035640 disclose an invention similar to that claimed.

Jelley et al. '900 teach serial laser etching to produce waveguiding features.

Ulrich et al., 'Self-Imaging in Homogeneous Planar Optical Waveguides", Appl. Phys. Lett., Vol. 27(6) pp. 337-339 (09/1975) and Neyer DE 3801272 teach couplers with wide central sections, relative to the entrance and exit waveguides.

JP 63-175808 teaches various waveguide shapes including the tapering shapes shown in figures 10,12 and 13.

Weber '433 teaches patterning areas, such as that shown in figure 1.

Presby '863 teaches patterning areas, such as that shown in figure 1.

17 Any inquiry concerning this communication or earlier communications from the examiner should be directed to Martin J Angebranndt whose telephone number is 703-308-4397. The examiner can normally be reached on Mondays-Thursday and alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 703-308-2464. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Martin J Angebranndt
Primary Examiner
Art Unit 1756

August 28, 2003